IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of :
Toru SUZUKI et al. : Attorney Docket No. 2001_0554A
Serial No. 09/854,528 : Group Art Unit 1731
Filed May 15, 2001 : Examiner John M. Hoffman

ORIENTED SINTERED CERAMIC PRODUCT AND MANUFACTURING METHOD THEREOF

DECLARATION UNDER 37 CFR 1.132

I, Toru SUZUKI residing at c/o National Institute for Materials Science, 2-1 Sengen 1-chome, Tsukuba-shi, Ibaraki, Japan, declare as follows:

1. Dr. Eng. (Materials Science and Engineering), Waseda University, Japan, 1995;
   M. Eng. (Materials Science and Engineering), Waseda University, Japan, 1992;
   B. Eng. (Materials Science and Engineering), Waseda University, Japan, 1990.
2. National Institute for Materials Science, Japan

Senior Researcher, Nano Ceramics Center, Fine Particle Processing Group (April 2006 - present);

National Institute for Materials Science, Japan

Senior Researcher, Materials Engineering Laboratory, Fine Particle Processing Group (April 2002 - March 2006);

National Institute of Science and Technology Policy,

Ministry of Education, Culture, Sports, Science and Technology

3rd Policy-Oriented Research Group(April 2004 - March 2005);

E. O. Lawrence Berkeley National Laboratory

Visiting Scholar, Material Science Division, Ritchie Group

(Oct. 2000 - Oct. 2001);

National Research Institute for Metals, Japan

Senior Researcher, Materials Processing Division (April 2000 - Mach 2002);

Researcher, Materials Processing Division (April 1996 - March 2000);

Waseda University, Japan

Research Assistant, Kagami Memorial Laboratory for Science and Technology (April 1995 - March 1996);

Waseda University, Japan

Research Assistant, Dept. of Materials Science and Engineering (April 1994 - March 1995).

3. List of patents and pulications authored or co-authored by Declarant; See attached list.

4. I have studied the above-identified application, Serial No. 09/854,528, the Office Action therein dated March 29, 2006, and the references relied upon by the Examiner in rejecting the claims.

5. In order to support the patentability of the presently claimed invention, I present the "Attached Sheet".

6. I further declare that all statements, including the attached sheet, made herein of my own knowledge are true, and that all statements on information and belief are believed to be true; and further that these statements were meade with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

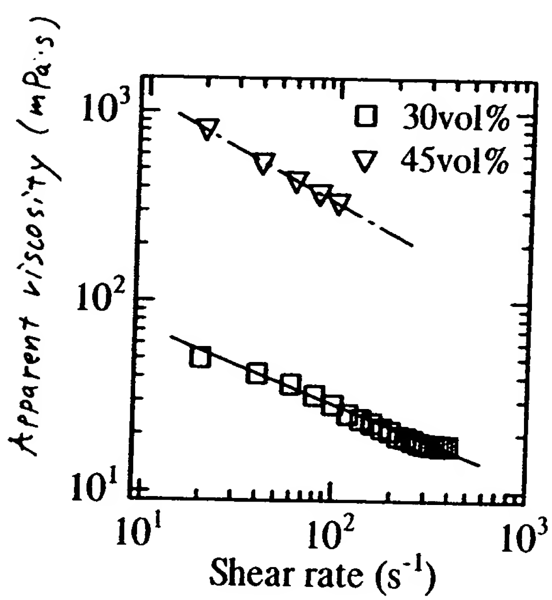
2006. 7. 25
Date

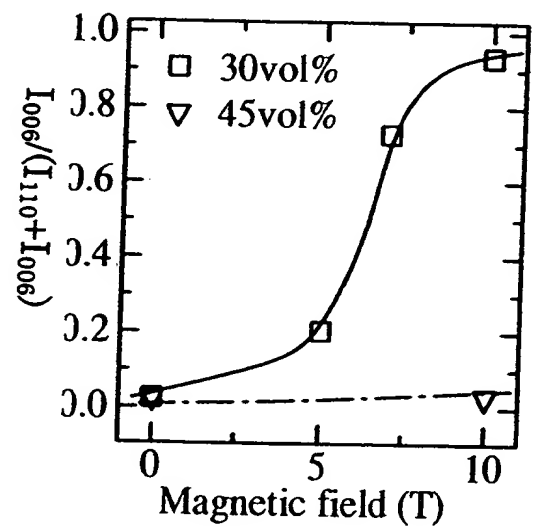
Toru Suzuki
Declarant; Toru SUZUKI

Paper list

1	T. S. Suzuki, T. Uchikoshi and Y. Sakka, "Control of texture in alumina by colloidal processing in a strong magnetic field", Sci. Tech. Adv. Mater, 7 (2006) 356-364.
2	T. S. Suzuki, T. Uchikoshi and Y. Sakka, "Textured Development in Alumina Composites by Slip Casting in a Strong Magnetic Field", J. Ceram. Soc. Japan, 114〔1〕(2006)59-62.
3	T. S. Suzuki and Y. Sakka: "Preparation of oriented bulk 5wt% Y_2O_3- AlN ceramics by slip casting in a high magnetic field and sintering", *Scripta Materialia*, **52** (2005) 583-586.
4	Y. Sakka, T. S. Suzuki, "New Processing of Textured Ceramics by Colloidal Processing Under High Magnetic Field", Key Eng. Mater., **280-283**(2005)721-728.
5	Y. Sakka and T. S. Suzuki, "Textured Development of Feeble Magnetic Ceramics by Colloidal Processing under High Magnetic Field", J. Ceram. Soc. Japan, **113**[1] (2005)26-36.
6	E. Guilmeau, C. Henrist, T. S. Suzuki, Y Sakka, D. Chateigner, D. Grossin and B. Ouladdiaf, "Texture of Alumina by Neutron Diffraction and SEM-EBSD", Mater. Sci. Forum, **495-497**(2005) 1395-400.
7	T. S. Suzuki, Y. Sakka, and K. Kitazawa: "Texture Development in Zirconia-Dispersed Alumina Composites by Slip Casting in a High Magnetic Field", IEEE Trans. on Applied Superconductivity, 14, 1584-1587 (2004).
8	T. S. Suzuki and Y. Sakka: "Control of Texture in Al_2O_3 Composites by Slip Casting in a Strong Magnetic Field Followed by Heating", Key Engineering Materials, **264-268**, 245-248 (2004).
9	T. S. Suzuki, Y. Sakka and K. Hiraga, "Control of Microstructure in Textured Alumina Based Ceramics Prepared by Colloidal Processing in a High Magnetic Field", Trans. Mater. Res. Soc. Japan, **29**[8] (2004)3375-78.
10	T. S. Suzuki and Y. Sakka: "Control of Texture in Electroceramics by Slip Casting in a High Magnetic Field", Key Engineering Materials, **248**, 191-194 (2003).
11	T. S. Suzuki and Y. Sakka: Fabrication of Textured Titania by Slip Casting in a High Magnetic Field Followed by Heating, Jpn. J. Appl. Phys., **41** (11A), L1272-L1274, 2002.
12	T. S. Suzuki and Y. Sakka: Control of Texture in ZnO by Slip Casting in a Strong Magnetic Field and Heating, Chem. Lett., 2002, 12, 1204-1205.
13	Y. Sakka, T. S. Suzuki and K. Kitazawa, "Fabrication of Textured Alumina through Slip Casting in a High Magnetic Field and Heating", Key Engineering Materials, **206-213**(2002)349-352.
14	Y. Sakka, T. S. Suzuki and K. Hiraga, "Fabrication of Tailored Alumina Ceramics by Novel Colloidal Processing," Key Engineering Materials, **224-226**(2002)619-22.
15	T. S. Suzuki, Y. Sakka, and K. Kitazawa: Orientation Amplification of Alumina by Colloidal Filtrated in a Strong Magnetic Field and Sintering, Adv. Eng. Mater., **3**(7), 490-492, 2001.

The disclosure of Wei et al is the usual colloid process of alumina, and the solid phase density is 45%. Even if the colloid solution of 45vol% is only applied to the magnetic field process disclosed by Topchiashvili, the alumina particles can be not oriented. In this case, even if the magnetic field of 10 T is applied, degree of orientation ($I_{006}/(I_{110}+I_{006})$) is about 0.05. Because alumina etc. has a very small magnetic susceptibility and it's particle is not rotated easily under a strong magnetic field, it is important to adjust the solid phase density of the solution in order that the particles can easily rotate. When the solid phase density is adjusted along with the new claim, for example 30 vol% the alumina particle is effectively oriented.





The effect of solid content and particle size on the degree of orientation

Average particle size; 0.03μm (TiO_2)
Magnetic field; 10T
Sintering temperature; 1573K

The degree of crystalline texture was determined using Equation (1) below and the intensities of X-ray diffraction measurements.

$$P = I_{002}/(I_{002} + I_{110}) \qquad (1)$$

where I_{002} and I_{110} are the intensities from the 002 and the 110 reflections on the surface perpendicular to the magnetic field, respectively. The degree of crystalline texture increases as the value of P approaches 1. For the specimen with 25 vol% solid content, the degree of crystalline texture is 0.081, which is very close to 0.091 in agreement with that calculated from the value of JCPDS cards as random orientation.

solid content of the slurry	Degree of orientation, P
20 vol%	0.934
25 vol%	0.081

Average particle size; 0.1μm (Al_2O_3)
Magnetic field; 10T
Sintering temperature; 1873K

The degree of crystalline texture was determined using Equation (2) below and the intensities of X-ray diffraction measurements.

$$P = I_{006}/(I_{006} + I_{110}) \qquad (2)$$

where I_{006} and I_{110} are the intensities from the 006 and the 110 reflections on the surface perpendicular to the magnetic field, respectively. The degree of crystalline texture increases as the value of P approaches 1. For the specimen with 45 vol% solid content, the degree of crystalline texture is 0.032, which is very close to 0.025 in agreement with that calculated from the value of JCPDS cards as random orientation.

solid content of the slurry	Degree of orientation, P
30 vol%	0.934
40 vol%	0.912
45 vol%	0.032

Average particle size; 0.4μm (AlN)
Magnetic field; 10T
Sintering temperature; 2173K

The degree of crystalline texture was determined using Equation (3) below and the intensities of X-ray diffraction measurements.

$$P = I_{100}/(I_{100} + I_{002}) \qquad (3)$$

where I_{100} and I_{002} are the intensities from the 100 and the 002 reflections on the surface perpendicular to the magnetic field, respectively. We could not obtain good slurry when the solid content is lager than 50vol%, so we did not estimate the degree of orientation.

solid content of the slurry	Degree of orientation, P
40 vol%	0.948
50 vol%	0.916